**Biomedical Science 553  
Bioinformatics Applications II  
Course Syllabus**

**Instructor:** Randall Johnson, PhD

**Course Description:** A continuation of Programming for Bioinformatics I. Statistics and R programming is extended to a broader range of biomedical applications. A deeper understanding will be gained of what can go wrong in data analysis, and best practices for reproducible research will be taught.

**Prerequisite:** BIFX 552 – Bioinformatics Applications I

**Required Textbook(s):** There is no required text for this course, but suggested readings will be given for students desiring to expand upon what is taught. See course repository for more details: <https://github.com/johnsonra/BIFX553>.

**Objectives:** BIFX 552 is meant to give students a solid foundation in statistical reasoning within the field of bioinformatics. In BIFX 553, students will expand their knowledge of statistical concepts to the analysis of primary data using intermediate to advanced programming skills.

**Student Learning Outcomes:** On completion of this course, students will be able to:

1. **Analyze** real data.
2. **Write readable R code** in the support of reproducible research.
3. **Present analysis results** in a clear, standard format.
4. **Work in small teams** to accomplish the objectives above.

**Grading:** Grades will be based on

Homework & in-class work 30%

Peer Review 20%  
Exam 25%  
Final exam 25%

**Weather:** In the event of severe weather resulting in the closure of Hood College and the cancellation of a regularly scheduled class, an optional online discussion will be held during the regular class time. The online discussion will be recorded and made available to students for 1 week following the missed class, and a supplementary assignment may be given.

**Tentative Schedule of Course Topics**

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| **Week** | **Topic** | **Application** |
| Jan 19 | BIFX 552 Review R Tips and Tricks | Scripting and Programming |
| Jan 26 | Linear Regression Diagnostics and Assumptions | Genetic Association |
| Feb 2 | Generalized Linear Modeling I | GWAS |
| Feb 9 | Generalized Linear Modeling II | GWAS |
| Feb 16 | GWAS Considerations | GWAS |
| Feb 23 | Survival Analysis Kaplan Meier, Proportional Hazards | Genetic Association |
| Mar 2 | Meta-Analysis | Micro Array |
| Mar 9 | Exam |  |
| Mar 16 | Spring Break |  |
| Mar 23 | Machine Learning I Supervised Learning | Prediction |
| Mar 30 | Machine Learning II Non-supervised Learning | Population Substructure |
| Apr 6 | Study Design I Bias, Variation and Error |  |
| Apr 13 | Study Design II Power and Sample Size Estimation |  |
| Apr 20 | Current Topics I | TBD |
| Apr 27 | Current Topics II | TBD |
| May 4 | Review |  |
| May 11 | Final Exam |  |